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FOREIGN TECHNOLOGY DIV WRIGHT-PATTERSON AFB OH  
CONSTRUCTION NORMS STRAIGHTENED. PART II. SECTION 6. CHAPTER 12--ETC (U)  
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# FOREIGN TECHNOLOGY DIVISION



CONSTRUCTION NORMS STRAIGHTENED, PART II, SECTION 3,  
CHAPTER 12, GAS SUPPLY, GAS-DISTRIBUTING STATIONS,  
CYLINDER AND RESERVOIR SETTINGS UP OF THE  
LIQUEFIED GAS OF THE NORM OF DESIGN,  
SN1P II-G.12-65



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Date 19 May 19 80

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# U. S. BOARD ON GEOGRAPHIC NAMES TRANSLITERATION SYSTEM

Block	Italic	Transliteration	Block	Italic	Transliteration
А а	А а	A, a	Р р	Р р	R, r
Б б	Б б	B, b	С с	С с	S, s
В в	В в	V, v	Т т	Т т	T, t
Г г	Г г	G, g	У у	У у	U, u
Д д	Д д	D, d	Ф ф	Ф ф	F, f
Е е	Е е	Ye, ye; E, e*	Х х	Х х	Kh, kh
Ж ж	Ж ж	Zh, zh	Ц ц	Ц ц	Ch, ch
З з	З з	Z, z	Ч ч	Ч ч	Ch, ch
И и	И и	I, i	Ш ш	Ш ш	Sh, sh
Я я	Я я	I, y	Щ щ	Щ щ	Shch, shch
К к	К к	K, k	Ъ ъ	Ъ ъ	"
Л л	Л л	L, l	Ы ы	Ы ы	"
М м	М м	M, m	Ь ь	Ь ь	"
Н н	Н н	N, n	Э э	Э э	E, e
О о	О о	O, o	Ю ю	Ю ю	Ia, ia
П п	П п	P, p	Я я	Я я	Ia, ia

\*Initially, after vowels, and after e, a, u elsewhere.  
When written as ё in Russian, transliterate as yé or é.

## RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sin	arcsin
cos	cos	on	coth	arc cos	arccos
tan	tan	th	tanh	arc th	arctanh
cot	cot	cth	ccth	arc cth	arcctanh
sec	sec	sch	sech	arc sch	arcsech
csc	csc	csch	csch	arc csch	arcsech

## Russian English

not  
lg  
curl  
log

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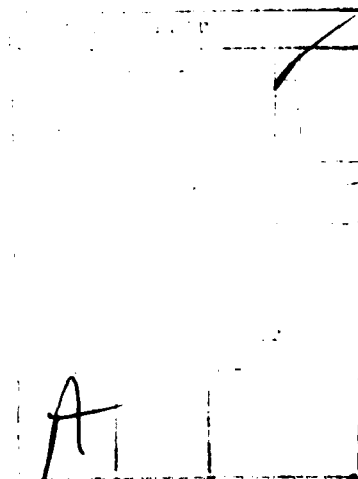
CONSTRUCTION NORMS STRAIGHTENED.

Part II, section G.

Chapter 12.

GAS SUPPLY. Gas-distributing stations. Cylinder and reservoir settings up of the liquefied gas at the norm of design. SNIP II-G.12-65.

Are affirmed by state committee on the matters of building of the USSR on 25 September, 1965.



Page 2.

Chapter SNIP II-G.12-65 "Gas supply. Gas-distributing stations. Cylinder and reservoir installations of liquefied gas. The norms of design" is developed by the Saratov state scientific research and design institute of Giprobligas of Ministry of Municipal Services the RSFSR.

With the introduction to the action of present chapter SNIP it loses force from 1 January, 1966, §7 chapters II-G-6 "gas supply" SNIP of publication 1954.

Editors - engineers A. M. Kosnik (GOSSTROY of the USSR), V. A. Kamayurov and S. A. Fedorov (Institute of Giprobligas MKKh RSFSR).

Page 3.

State Committee of the Council of Ministers of the USSR on matters of building (GOSSTROY of the USSR).

Construction norms it straightened.

Gas supply. Gas-distributing stations. Cylinder and reservoir

installations of liquefied gas. Norms of design.

SNIP II-G.12-65.

Instead of §7 chapters II-G.6 SNIP of publication 1954.

1. General/common/total indications.

1.1. Norms and rules of present chapter apply to design of newly projected and reconstructed gas-distributing stations, cylinder and reservoir installations, intended for supply with hydrocarbon gases of users in habitable and public buildings, in communal general and industrial enterprises, and also in agricultural objects, which use liquefied hydrocarbon gases as fuel/propellant.

1.2. System of gas supply, examined/considered in present chapter, based on natural regasification of liquefied hydrocarbon gases, is part of overall diagram of gas supply of populated places, industrial and agricultural areas, determined chapter SNIP II-G-13-62 "Gas supply. External networks/grids and constructions. The norms of design", and it must be provided for in the absence of natural gas or technical and economic irrepealability of its use for the gas supply of one or the other users of gas.

1.3. In present chapter is examined storage of liquified hydrocarbon gases under pressure only in metallic reservoirs and bottles.

Norms and rules of the design of storage of the liquified hydrocarbon gases and isothermal and nonmetallic reservoirs, underground storage and other devices in present chapter are not examined; a design of these gasolders should be accomplished/realized on the appropriate standard documents.

1.4. During design of gas-distributing stations, and also cylinder and reservoir installations of liquified gas in addition to norms and rules of present chapter should be taken guided demands of chapters SNIP I-G-3-62 "Gas supply. Internal devices. Materials, equipment, fittings and part", I-G.9-62 "Gas supply. External networks/grids and constructions. Materials, articles, equipment and composite constructions/designs", II-G.11-62 "Gas supply. Internal gas equipment. Norms of design", II-G.13-62 "Gas supply. External networks/grids and constructions. Norms of design", III-G.2-62 "gas supply. Internal devices. Straightened production and inspection/acceptance of works", III-G.7-62 "Gas supply. External networks/grids and constructions. Straightened organizations and productions in the works. Inspection/acceptance in the operation", the "Rules of safety in the gas economy" of Gosgortekhnadzor of the



SSFSR, the "Rules of device and safe operation of the vessels, which work under the pressure", affirmed by Gosgortekhnadzor the USSR, "straightened the device of electrical devices" state production committee on power engineering and electrification of the USSR, and also by the requirements of other corresponding chapters SNIP and standardizing documents.

1.5. During design of gas-distributing stations, and also cylinder and reservoir installations which are newly constructed and reconstructed under seismic areas, zones of propagation of permafrost soils and other special conditions of building, should be considered additionally requirements of corresponding standard documents.

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1.6. Liquified hydrocarbon gases, supplied for gas supply from gas-distributing stations in question, cylinder and reservoir installations must satisfy the requirements GOST 10196-62 "Gases hydrocarbon, liquified, fuel".

1.7. During design should be applied for construction of gas-distributing stations, cylinder and reservoir installations, equipment, instruments and fittings, serially produced by industry according to GOSTs or technical specifications, approved in routine.

Note. The use/application of experimental models, and also imported equipment, instruments, equipment and fittings is allowed/assumed according to the agreement with the state production committee on the gas industry of the USSR, the organs/controls of Gosgortekhnadzor and the organizations, which know by the operation of gas economy.

1.3. Order of fulfillment of planned works, composition and volume of designed materials must correspond to requirements of effective commands of GOSSIBOY of the USSR.

## 2. Gas-distributing stations.

2.1. Gas-distributing stations are supply base of users with liquified hydrocarbon gases and are intended for procedure, storage and delivery by users of liquefied gas, which enters rail-, water or truck transport from enterprises where are produced these gases.

2.2. In accordance with technological process of procedure, storage and delivery to users of liquefied gas at gas-distributing stations it is to provide for and to furnish in their territory following basic buildings and constructions:

a) drainage pier with railroad branch for drain of entering in railroad tank cars liquefied gases;

b) to capacity/capacitance (reservoirs) for procedure and storing liquefied gas;

c) pump-and compressor department/separation for pumping of liquefied gas;

d) filler department/separation for the emptying of bottles from unevaporated remainders/residues of liquefied gas, steaming, inspection and infusion by the liquefied gas of bottles with the open loading-unloading areas/sites with the mounting fixture for positioning/arranging of the filled with gas bottles and their loading for the automobiles to the users, and also for the unloading and the procedure from the users of empty bottles;

e) intra-area conduits/manifolds for the transportation of the liquefied gases;

f) building for repair shop, administrative-office locations and boiler room;

g) the intra-area conduits/manifolds of the water-supply systems, channelization and heat supply;

h) column for the infusion of liquefied gas into the tank cars;

i) garage with the open apron for the automobiles.

Notes: 1. In filler department/separator can be included the department/separation or regasification and mixing of liquefied gas with the air.

2. If delivery/procurement of liquefied gas to gas-distributing station is provided for by truck transport, then construction of drainage piers is not required, but draining of gas it must be produced in capacity/capacitance directly from tank cars.

3. Enumeration of buildings and constructions of gas-distributing stations depending on their productivity and designation/purpose is established by project in accordance with effective standard documents according to agreement with organs/controls of fire and sanitary supervision, and also by organs/controls of Gosgortekhnadzor taking into account local

conditions of supplying gas to users of gas.

2.3. Construction of gas-distributing stations should be provided for for gas supply of users:

a) habitable and public buildings of cities and other populated areas;

b) municipal and industrial enterprises;

c) objects of agricultural production, habitable and public buildings in rural locality.

2.4. Productivity of gas-distributing station should be determined in depending on annual necessity for liquefied gas of city or another populated area, industrial enterprises and other users of gas, in accordance with instructions of chapter SNIP II-G.13-62 "Gas supply. External networks/pipes and constructions. Norms of design" taking into account the long-range plan of the development of gas supply.

The productivity of gas-distributing station must be matched with the project of the building-up of the area, operated by station, to the next years and for the calculated period, taking into account

the use of a liquefied gas by all planned users of this form of fuel/propellant.

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2.5. Gas-distributing stations should be furnished predominantly out of feature of residential territory of city and other populated areas. If necessary for the construction of station in the limits of urban feature, for example in the industrial enterprises, it must be placed out of the densely populated areas and as far as possible from the lee side for the winds of the predominant direction.

The arrangement/position of gas-distributing stations in the places of mine workings and karstic phenomena is not allowed/assumed.

2.6. When selecting an area/site for building of gas-distributing station it is necessary to consider possibility of guaranteeing required clearance between buildings and constructions of station as well as its surrounding buildings and constructions, possibility of connection of siding and roads of station to railroad network/grid and highways of populated area, and also possibility to provide power supply, water supply, channelization, telephone communication, radio relaying and heat supply (with external heat source) of station.

The selection of area/site under the building of gas-distributing station must be matched with the organs/controls of state fire and sanitary supervision, Gosgortekhnadzor and other interested organizations.

2.7. Arrangement/position of reservoirs of liquefied gas of gas-distributing stations should be provided for with breakage from buildings and constructions.

Minimum distances from the reservoirs of the liquefied gas of gas-distributing stations to the roads, the habitable, public and industrial buildings and the constructions, which do not relate to gas-distributing stations, should be accepted on Tables 1, 2, 3 and 4.

Table 1. Minimum distances from the reservoirs of the liquefied gas of gas-distributing station to the buildings and the constructions, which do not relate to the gas-distributing station.

Общий объем резервуаров в м <sup>3</sup> (1)	Максимальный объем одного резервуара (2) в м <sup>3</sup>	Расстояние в м (3)	
		резервуары, расположенные на земле (4)	резервуары, расположенные под землей (5)
1	2	3	4
До 200 включительно (6)	25	100	50
От 201 до 500 включительно (7)	50	200	100
От 501 до 1000 включительно (8)	100	300	150
От 1001 до 2000 включительно (9)	100	400	150
Свыше 2000 до 8000 включительно (10)	Свыше 100 (11)	500	200

Notes: 1. Distances from the reservoirs of gas-distributing station with the ground-based arrangement of reservoirs to the places of person's accumulation (for example, stadiums, markets, fairs, exhibitions, theaters, etc.) more than 800 people should be increased 2 times against those indicated in Table 1.

2. Distance between two gas-distributing stations in total volume of reservoirs of 8000 m<sup>3</sup> must be not less than 500 m.

3. Is allowed/assumed maximum volume of one reservoir (or of 2 tables 1) to accept for gas-distributing stations upon one step/stage more, in this case distances of buildings and constructions (or 3 and



Tables 1) should be accepted as Tables 1, which correspond to maximum capacity/capacitance of each reservoir accepted.

Key: (1). Total volume of reservoirs in  $m^3$ . (2). Maximum volume of one reservoir in  $m^3$ . (3). Distance m. (4). reservoirs, arranged/located on earth/ground. (5). reservoirs, arranged/located underground. (6). To inclusively. (7). From to inclusively. (8). It is more than to inclusively. (9). It is more than.

Table 2. Minimum distances from the reservoirs of the liquefied gas of gas-distributing station to the railroad and highways.

Наименование дорог (1)	Расстояния в м при общем объеме резервуаров (2)			
	3) до 200 м <sup>3</sup>		4) свыше 200 м <sup>3</sup>	
	резервуары, расположенные на земле (5)	резервуары, расположенные под землей (6)	резервуары, расположенные на земле (5)	резервуары, расположенные под землей (6)
Железные дороги общей сети (до подошвы насыпи или бровки выемки со стороны резервуаров) (7)	100	75	125	100
Подъездные железнодорожные пути промышленных предприятий и трамвайные пути (до ближайшего рельса), автомобильные дороги (до обочины дороги) (8)	50	25	75	40

Key: (1). Designation of roads. (2). Distances m with total volume of reservoirs. (3). to. (4). it is more than. (5). reservoirs, arranged/located on earth/ground. (6). reservoirs, arranged/located underground. (7). Iron roads of general/common/total network/grid (to

the foot of mound or edge of indentation from the side of reservoirs). (3). Approach railway lines of industrial enterprises and tramroads (to nearest rail), highways (to curb of road).

Table 3. Minimum distances from the reservoirs of the liquefied gas of the gas-distributing station, placed in the territory of industrial enterprise, to the buildings and the constructions, which do not relate to the gas-distributing station.

Общий объем резервуаров в м <sup>3</sup> (1)	Максимальный объем одного резервуара в м <sup>3</sup> (2)	(3) Расстояние в м	
		резервуары, расположенные на земле (4)	резервуары, расположенные под землей (5)
До 50 включительно	10	40	—
От 51 до 100	25	60	30
От 101 до 200	50	100	50
Свыше 200, но не более 500	50	150	75

Notes 1. During the design of gas-distributing stations for industrial enterprises, which have the total volume of reservoirs it is more than 500 м<sup>3</sup>, or, independent of the volume of the reservoirs, which supply with gas of users, and are located out of the territory of industrial enterprises, distances from the reservoirs of liquefied gas to the buildings and the constructions should be accepted in accordance with tables 1, 2 and 3.

2. Distances from reservoirs of liquefied gas of gas-distributing station to placed out of its buildings aggregates/units and installations with processes, placed on fire

hazard in category G on Tables 1 of chapter SNIP II-M.2-62. "The production buildings of industrial enterprises. The norms of design", should be accepted upon 50c/c large ones, indicated in Table 3.

3. Distances from reservoirs of liquefied gas of gas-distributing stations in total volume of reservoirs to 50 m<sup>3</sup> inclusively, placed underground to buildings and constructions, should be accepted in accordance with indications of section "reservoir installations of liquefied gas" of present chapter.

Key: (1). Total volume of reservoirs in m<sup>3</sup>. (2). Maximum volume of one reservoir in m<sup>3</sup>. (3). Distances m. (4). reservoirs, arranged/located on earth/ground. (5). reservoirs, arranged/located underground. (6). To inclusively. (7). From to. (8). From to. (9). It is more than but not more.

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Minimum distances from the reservoirs of the liquefied gas of gas-distributing stations to the buildings and the constructions of these gas-distributing stations should be accepted in accordance with Tables 5.

2.3. On perimeter of territory of gas-distributing station must

be provided for latticed enclosure of incombustible materials in height not less than 2.4 m.

2.9. Territory of gas-distributing station with total volume of storage tanks of liquefied gas of more than 200 m<sup>3</sup> should be provided for by divided by enclosure height/altitude of lightened type 1.2 m (for example, from wire net with square cells on reinforced-concrete supports) to two zones:

a) working zone, which switches on tank farm with drainage pier, pump-and compressor and tiller departments/separations and columns for filling with liquefied gas of tank cars;

b) auxiliary zone, which switches on block of auxiliary locations, garage with open apron of motor vehicles, and also in the case of absence of centralized water supply, storage tank of fire-fighting water supply and water tower.

Note. In the territory of the auxiliary zone of gas-distributing station it is allowed/assumed to provide for the arrangement/position of the traffic department of the gas economy of municipal organs/controls, with the substantiation of the advisability of this arrangement/position by project.

Table 4. Minimum distances from the reservoirs of the gas-distributing station, placed in the territory of industrial enterprise, to and from highways of industrial enterprise.

Наименование дорог (1)	Общий объем резервуаров в м <sup>3</sup> (2)	(3) Расстояние в м	
		резервуары, расположенные на земле (4)	резервуары, расположенные под землей (5)
Железные дороги (6)	До 100 (7)	20	10
То же (8) . . . . .	Свыше 100	40	20
Автомобильные дороги (10) . . . . .	До 100 (7)	20	10
То же (8) . . . . .	Свыше 100 (9)	30	15

Key: (1). Designation of roads. (2). Total volume of reservoirs in m<sup>3</sup>. (3). Distances m. (4). reservoirs, arranged/located on earth/ground. (5). reservoirs, arranged/located underground. (6). Iron roads. (7). To. (8). then. (9). It is more than. (10). Highways.

Table 5. Minimum distances from storage tanks of liquefied gas to the buildings and constructions of gas-distributing station.

Наименование зданий и сооружений, для которых определяются расстояния (1)	(2) Расстояние в м	
	резервуары, расположенные на земле (3)	резервуары, расположенные под землей (4)
1	2	3
Сварочная эстакада (5) . . . . .	20	15
Пути железнодорожной ветки (до ближайшего рельса) (6) . . . . .	20	15
Здания насосно-компрессорного отделения и наполнительного отделения с открытой площадкой для погрузки баллонов на автомашины (7) . . . . .	15	10
Здания отделений по газификации и смешению газа с воздухом . . . . .	15	10

Здания для размещения ремонтных мастерских, складов, насосной станции, гаража, котельной .	50	30
(10) Здания административно-конторских помещений . . . . .	30	30
(11) Колонки для налива сжиженного газа в автоцистерну . . . . .	30	20
(12) Автомобильные дороги (до ближайшего бордюрного камня) . . . .	10	10
(13) Ограждение территории . . . .	10	10
(14) Резервуары с запасом воды для пожаротушения . . . . .	40	40

Notes: 1. Minimum distances from storage tanks of liquefied gas to the buildings and constructions of the gas-distributing station, indicated in Table 5, should be provided for for all gas-distributing stations independent of their productivity, arrangement and designation/purpose.

2. Buildings of substations and location of electrical distribution devices should be placed in accordance with demands of chapter VII-3 "Inculcated devices of electrical devices" state production committee on power engineering and electrification of USSR.

3. In assignments, which are found on territory of gas-distributing station, isolation/liberation of locations for dwelling to provide for is not allowed/assured.

Key: (1). The designation of assignments and constructions, before which are determined the distances. (2). Distances m. (3). reservoirs, arranged/located on earth/ground. (4). reservoirs, arranged/located underground. (5). Drainage pier. (6). Ways of siding (to nearest rail). (7). Buildings of pump-and compressor department/separation and roller department/separation with open area/site for loading of bottles to motor vehicles. (8). Building of departments/separations on regasification and mixing of gas with air. (9). Buildings for positioning/arranging of repair shops, storages, pumping station, garage, boiler room. (10). Buildings of administrative-office locations. (11). Columns for infusion of liquefied gas into tank car. (12). Highways (to nearest curbstone). (13). Enclosure/protection of territory. (14). Reservoirs with water supply for fire extinguishing.

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2.10. Planning of territory of gas-distributing station and

system of drains must provide normal drain with simultaneous protection of station from incidence/impingement to its territory of thawed and downpour water runs without.

2.11. During layout of railroad and highways of gas-distributing stations it is necessary to be guided by instructions of following chapters SNIP II-D.2-62 "Iron roads of track 1525 mm of industrial enterprises. Norms of layout" and II-D.6-62 "the highways of industrial enterprises. Norms of design", and also by the instructions of present chapter.

2.12. On railway lines of gas-distributing stations in places of drain must be provided for straight/direct sections by length, which corresponds to quantity of drainage devices, with draft/gradient not more than 0.003.

For the uncoupling of composition must be provided for additional tangential path from the side of blind alley in length not less than 20 m.

2.13. As means for maneuvering movement of railroad tank cars by railway lines within territory of gas-distributing station one should provide mechanisms, which correspond to conditions for safe operation of devices with explosive media.



2.14. Territory of gas-distributing station must be imparted with highways of general/common/total use, entrances in width not less than 7 m. For the gas-distributing stations in volume of the tank farm of more than 500 m<sup>3</sup> must be provided for two entrances.

2.15. Highways in territory of gas-distributing station should be placed in II category of roads of industrial enterprises.

2.16. Highways for fire-fighting passages must be projected/designed for two lines of traffic.

The width of highways in the territory of gas-distributing station to two lines of traffic must be accepted not less than 7 m, but for one line of traffic - 3.5 m.

Before the entrance to the gas-distributing station it is necessary to provide for the asphalted area/site for turn and apron of motor vehicles by sizes/dimensions in accordance with the dimensions of the utilized automobiles.

2.17. Minimum distances from edge of transient part of highways of gas-distributing stations to buildings and constructions,

arranged/located in territory of gas-distributing stations, should be accepted on tables 6.

2.18. Bridges and passages at gas-distributing stations must be provided for from incombustible materials.

2.19. Production buildings and constructions of gas-distributing stations should be projected/designed on the basis of demands of chapters SNIP II-M.2-62 "Production buildings of industrial enterprises. Norms of design", II-A.5-62 "Fire-fighting requirements. Basic condition/positions of design", "Sanitary norms of the design of industrial enterprises" (SN 245-63), and also demands of present chapter.

2.20. Production processes in buildings and locations of pump-and compressor and filler departments/separations (among other things in locations for installations of regasification and mixing of liquefied gas) should be on fire hazard carried to category A.

Remaining buildings and locations of gas-distributing station in which are placed repair shops, garage, boiler room and other productions, should be on the fire hazard placed in categories G and D.

Note. During the ticking of productions with different categories on the fire hazard in the buildings or the placements should be established their category in accordance with the highest category of production or the fire hazard.

Table 6. Minimum distances from the edge of transient part are automobile the roads of gas-distributing station to buildings and constructions of gas-distributing station.

Наименование зданий и сооружений	Расстояние (2) в м
Здания длиной до 20 м (3) . . . . .	1,5
То же, более 20 м (4) . . . . .	4,5
Сливная эстакада (5) . . . . .	10
Колонки для налива сжиженного газа	
автоцистерны . . . . .	1
Ограждение станции (7) . . . . .	1,5

Note. Areas/sites for the entrance of automobiles can be provided for close to the buildings from the side of anechoic wall and not nearer than on 4 m from the side of walls with the apertures.

Key: (1). Designation of buildings and constructions. (2). Distances. (3). Buildings by length to 1. (4). Then, is more than 1. (5). Drainage pier. (6). Columns for infusion of liquefied gas of tank car. (7). Enclosure/protection of station.

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2.21. Production buildings and constructions of gas-distributing stations on explosiveness, according to "Rules of device of electrical devices" of state production committee on power

engineering and electrification of USSR, should be carried to classes:

a) buildings and locations of pump-and compressor and filler departments/separations (with location of regasification and mixing of gas with air) - to class V-1a (with category and group of dangerously explosive medium V-1c);

b) reservoirs, drainage pipes, columns for the infusion of liquefied gas, and also available outdoors departments/separations pump-and compressor, fillings, drain and ore washer of bottles, regasification of liquid phase and mixing of gas with the air - to class V-1g.

For the remaining buildings and the locations of the gas-distributing station in which are placed repair shops, garage, boiler room and other productions, classification of the location of electrical equipment it is not established.

2.22. Buildings in which is provided for arrangement/position of pump-and compressor, filler departments/separations and installation of regasification of liquid phase, must be provided for by single-stage ones, without garrets and basererts, I or II degree of refractoriness. Each department/separation should be furnished in the

isolated/insulated location, which has independent output/yield.

Doors must be opened/disclosed outside, in windows in the upper part must be provided for the transoms, equipped by device for the opening from the floor/sex.

Is allowed/assumed unification into one location of several departments/separations, connected with the general/common/total technological process: drain and filling of bottles, regasification and mixing of gases, etc.

In one building with the dangerously explosive departments/separations they can be placed: the ventilation chamber/camera, wardrobe, wash, sanitary unit, if the locations indicated are isolated from the dangerously explosive ones by anechoic walls.

2.23. Loading-unloading areas/sites must be provided for in annexes to filler departments/separations. The size/dimension of area/site taking into account the proper passes must be accepted with the calculation of the guarantee of arrangement/position of bottles in a quantity not less than calculated diurnal productivity.

Above the loading-unloading areas/sites of the empty and filled

with liquefied gases bottles should be arranged the mounting fixtures from the reinforced-concrete composite elements/cells with asbestos-plywood roofing.

The height/altitude of mounting fixture must be accepted in the dependence on the height/altitude of the platforms of the conveying devices, which transport bottles.

#### DRAINAGE AND FEEDING DEVICES.

2.24. For drain into reservoirs of liquefied gases, which enter gas-distributing stations in railroad tank cars, must be provided for drainage devices, which it is allowed/assumed to furnish on the one hand of railway line (one-sided) or between two railway lines (bilateral) and should be united between themselves pier.

2.25. Device of pier should be provided for from incombustible materials with special areas/sites and staircases for connection of drainage devices of gas-distributing station with cisterns.

Fastening conduits/manifolds and collectors/receptacles of the steam and liquid phases of liquefied gas should be provided for to the pier.

2.26. Quantity of drainage devices is to determine by project, and it must correspond to quantity of cisterns which can be simultaneously given to railway lines of gas-distributing station under drain.

2.27. Installations for filling of bottles and drain of unevaporated remainders/residues, in depending on climatic conditions, can be placed in closed heated locations or on open pads under mounting fixture in areas with mean temperature of surrounding air of coldest month of 0°C.

2.28. Filling of bottles with liquefied gas can be provided for both by weight (by hand) and by volume with the aid of dosing apparatuses (in a mechanized manner).

For mechanizing the filling of bottles should be provided for the use/application of automatic devices (for example, revolving type feeding automatic machines).

For displacing the empty and filled bottles should be provided conveyers.

With the mechanized method of the filling of bottles should be provided for the verification test by weighing.



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2.29. Quantity of posts for filling of bottles with liquefied gases of gas-distributing station can be determined from formula:

$$m_n = \frac{q_n t_n}{T_n V_{0TK}} \quad (1)$$

where  $m_n$  — calculated quantity of posts;

$q_n$  — diurnal quantity of liquefied gas, tempered in bottles, in kg;

$t_n$  — duration of servicing one bottle in min (4-5 min to one bottle with a capacity/capacitance of 50 l);

$T_n$  — duration of operation of gas-distributing station in min;

$V_0$  — volume of one bottle in l;

$K$  — coefficient considering the degree of filling of bottles, taken in accordance with the "Rules of device and safe operation of the vessels, which work under the pressure", affirmed by Gosgortekhnadzor of the USSR;

$\gamma$  - the specific gravity/weight of gas in kg/l.

2.30. Distance between posts for filling of bottles with liquefied gases must be not less than 1 m.

2.31. For removing unevaporated residual gases from bottles should be provided drainage installations.

A number installations for the drain should be designed from the maximum of quantities of emptied bottles and determined from the formula:

$$m_{ca} = \frac{at_{ca}}{T_{ca}}, \quad (2)$$

where  $m_{ca}$  - quantity of the posts:

$a$  - quantity of emptied bottles in pcs;

$t_{ca}$  - duration of the drain of one bottle in min;

$T_{ca}$  - duration of the work of drainage installation of remainders/residues in min.

The drain of the remainders/residues of liquefied gases from the bottles should be provided for into the special reservoir, placed out

of the building of supplementary department/separation at a distance not less than 8 m.

The removal/distance of residual gases from the reservoir must be provided for by the method of extrusion by the overpressure, created by the steam phase of liquefied gases.

2.32. Constructions/designs of drainage and feeding devices must be sealed.

2.33. For transportation of liquefied gas in drainage and feeding devices should be applied rubber-fabric hoses/pipes, manufactured according to GOST 8318-57\*, type B, designed for operating pressure 15 kg/cm<sup>2</sup>.

Capacities/capacitances (reservoirs) of liquefied gas.

2.34. For procedure and storing liquefied gas, which enters from enterprises where it is produced, at gas-distributing station, should be provided for installation of special capacities/capacitances (reservoirs).

2.35. Quantity of days, reserved for storing liquefied gas at gas-distributing station, should be calculated taking into account

local specific conditions of gas supply (for example, daily mean gas flow from time to time of year, increase in gasification of objects, etc.).

For the tentative calculation (as first approximation) is recommended a quantity of days, reserved for storing the liquefied gas at the gas-distributing station depending on distance from the source of obtaining gas, to accept on Tables 7.

With the distances of the source of obtaining liquefied gas of more than 2000 km the value of the reserve of liquefied gas on the gas-distributing station must be in each individual case matched with the supplier plant of liquefied gas.

For the areas with the severe climatic conditions the reserve of liquefied gas at the gas-distributing station must be increased taking into account the local conditions.

2.36. In project of gas-distributing station, arranged/located in immediate proximity of enterprise, which produces liquefied gas, and also for auto-refueling stations of liquefied gas, for which is provided for obtaining liquefied gas from gas-distributing station, reserve of gas can be reduced to two days.

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During the design of gas-distributing station for the arrangement/position in the territory of industrial enterprise the reserve of liquefied gas should be determined in depending on accepted for this industrial enterprise norm for storage of standby fuel/propellant.

Table 7. Quantity of days, reserved for storing the liquefied gas at the gas-distributing stations.

Расстояние от источника получения газа в км (1)	Количество суток (2)
До 500 (3) . . . . .	5
От 500 до 1000 (4) . . . . .	5-8
От 1001 до 1500 (4) . . . . .	8-12
От 1501 до 2000 (4) . . . . .	12-14

Key: (1). Distances from the source of obtaining gas in km. (2). Quantity of days. (3). To. (4). From to.

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2.37. Necessary quantity of reservoirs at gas-distributing station for storing liquefied gas can be determined according to formula:

$$m = \frac{V}{V_p K}, \quad (3)$$

where m - quantity of reservoirs in pcs,

V - reserve of liquefied gas at gas-distributing station in m<sup>3</sup>;

K - coefficient, which considers degree of filling of reservoirs which is accepted in accordance with "rules of device and safe

operation of vessels, which work under pressure", affirmed by Gosgortekhnadzor of USSR;

$V_p$  — volume of the reservoir in  $m^3$ .

2.38. During design of gas-distributing stations, as a rule, must be provided for ground-based erection of tank.

Underground erection of tank is allowed/assumed in the exceptional cases with the impossibility of guaranteeing the norms of breakage, established/installed for the ground-based arrangement.

The arrangement/position of reservoirs in the locations is not allowed/assumed.

2.39. For erection of tank should be provided for foundations of incombustible materials with limit of refractoriness not less than 2 h (for example, concrete, rubble concrete, reinforced concrete). the erection of tank on foundation must be provided for with draft/gradient 0.002-0.003 to the side of drainage branch connection. Load from the reservoir on all supports must be distributed evenly.

2.50. For procedure and storing liquefied gas should be applied reservoirs, manufactured in accordance with demands of chapter SNIP

I-G.9-62 "Gas supply. External networks/grills and constructions. Materials, articles equipment and composite constructions/designs".

2.41. Ground-based arranged/located reservoirs of gas-distributing station should be considered such, whose lower part of generatrix is on one level or is higher than lowest planning mark of adjacent territory, and also when reservoirs are sunk less than to half diameter.

2.42. During arrangement of ground-based reservoirs in areas with maximum temperature of surrounding air, higher than 35°C must be provided for measures, which prevent heating liquefied gas in reservoirs (for example, water cooling, coloration of reservoirs in white color, sometimes device of mounting fixtures, etc.).

2.43. In ground-based reservoirs for maintenance/servicing should be provided for stationary metallic area/site.

Area/site must be equipped in accordance with requirements of safety engineering and have march staircase with the rails in wide not less than 0.7 m with the draft/gradient not more than 45°.

With the device of one area/site for several reservoirs flights of stairs are provided for at the ends of the area/site. At the



length of area/site of more than 60 m in its middle part is provided for additional march staircase.

The design of staircase-connections for servicing the reservoirs is not allowed/assumed.

2.44. Ground-based reservoirs at gas-distributing station should be had available groups in area of lowered/reduced planning marks of area/site of station.

A minimum quantity of groups of reservoirs should be assumed equal to two. The maximum volume of the group of reservoirs must be established in accordance with Tables 8.

2.45. Clearances between ground-based reservoirs in group must be equal to diameter of larger adjacent reservoir, but not less than 2 m.

Minimum clearances between the groups of reservoirs must be accepted on Tables 9.

2.46. During arrangement/position of ground-based reservoirs of liquefied gas in two series/rows and more distance between series/rows must be equal to length overall reservoir, but not less than 10 m.

Table 8. Maximum total volume of the groups of reservoirs.

Общий объем резервуаров в м <sup>3</sup> (1)	Максимальный общий объем резервуаров в группе в м <sup>3</sup> (2)
До 2000 (3) . . . . .	1000
Свыше 2000, но не более 8000 (4)	2000

Key: (1). Total volume of reservoirs in м<sup>3</sup>. (2). Maximum total volume of reservoirs in group in м<sup>3</sup>. (3). To. (4). It is more than but not more.

Table 9. Minimum distances between the groups of the reservoirs, arranged/located ground-based.

Общий объем резервуаров в группе в м <sup>3</sup> (1)	Расстояние между внешними образующими крайних резервуаров в м (2)
До 200 (3) . . . . .	5
От 201 до 700 (4) . . . . .	10
От 701 до 2000 . . . . .	20

Key: (1). Total volume of reservoirs in the group in м<sup>3</sup>. (2). Distance between external generatrices of end reservoirs m. (3). To. (4). From to.

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2.47. For each group of ground-based reservoirs on perimeter must be provided for closed embankment or enclosing wall from incombustible materials (for example, from brick, rubble concrete, concrete, etc.) in height not less than 1 m. The width of earth shaft (on the top) must be 0.5 m.

2.48. Distance from walls of reservoirs to bottom of embankment or enclosing wall must be equal to half diameter of nearest reservoir, but not less than 1 m.

2.49. For removing downpour and thaw water from embanked territory in earth shaft or wall must be provided for tubes or duct with device on them from outer side of tripping devices (for example, gates, catches, etc.).

2.50. For entry to embanked territory on both sides of embankment or enclosing wall must be provided for staircase-transitions/transfers with a width of 0.7 m not less than two to each group, located in different ends embankments.

2.51. Underground arranged/located reservoirs of gas-distributing stations should be considered such, whose highest level of liquid is lower than lowest planning mark of adjacent territory not less than 0.2 m. To the buried tanks are equated those on ground but those having filling by soil by the height/altitude not less than 0.2 m higher than the highest level of liquid in the reservoir and in width not less than 6 m, counting from the wall of reservoir to the edge of sprinkling. Above the reservoirs, completely sunk into the earth/ground, without depending on the depth of laying must be provided for the mound above the planning territory.

Note. As the adjacent to the reservoir territory is considered territory at a distance of 6 m from the wall of reservoir.

2.52. For underground installation up must be provided for only cylindrical reservoirs with arrangement of them horizontally.

2.53. In the absence of ground water buried tanks it is allowed/assumed to establish directly to soil. Soil must be dense, with the bearing capacity not less than 0.25 kg/cm<sup>2</sup>.

In the presence of soil with the bearing capacity of less than 0.25 kg/cm<sup>2</sup> for the erection of tank must be provided for the foundations from the incombustible materials (for example, stone, concrete, reinforced concrete, etc.). The filling of reservoirs must be provided for sand or by the soft ground, which does not contain of organic admixtures/impurities.

2.54. If necessary during design of installation of buried tanks on swelling soil latter must be replaced sand at depth of freezing, while in places with high standing of ground water (higher than lower generatrix of reservoirs) must be provided for devices, which prevent reservoirs from flotation (for example, device of anchors, loads, etc.).

2.55. Distance between separate buried tanks must be equal to half diameter of larger adjacent reservoir, but not less than 1 m.

2.56. Entire monitoring and measuring, gauging, safety and close fitting valve of buried tanks must be provided for installation of nonfilled part and be shielded of damages.

2.57. For protection from soil corrosion buried tanks must be to cover with anticorrosive insulatic/isolation. The category of insulation/isolation is determined in the conformity in by the

instructions of chapter SNIP ~~III~~ II-g.13-62 "gas supply. External networks/grids and constructions. Norms of design".

Insulation/isolation, as a rule, must be accepted that not below intensified.

If necessary for the preservation of reservoirs from the stray current corrosion must be called for the cathodic protection. The forms of cathodic protection must be determined designed organization during the design gas-distributing station.

#### PUMPS AND COMPRESSORS FOR THE LIQUEFIED GAS.

2.58. For pumping over of liquid and steam phases of liquefied gas at gas-distributing station must be provided for use/application of pumps and compressors which by their construction/design can be suitable for these purposes (for example, centrifugal and vortex/eddy pumps, ammonia compressors).

2.59. Arrangement/position of pumps and compressors of gas-distributing station should be provided for in one heated location or on open pad under mounting fixture in areas with mean temperature of surrounding air of coldest month not lower than 0°C (if this is allowed/assumed for constructions/designs of pumps and compressors accepted).

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The floor/sex of location or from the covered area/site must be provided for on the same level or higher than adjacent to them territory (without the sinkings).

2.60. During arrangement/position in one series/row of several pumps or compressors width of pass from wall along their front must be accepted not less than 1.5 m. The distance between the separate pumps or the compressors must be not less than 0.8 m.

2.61. On suction and pump discharges and compressors must be provided for setting up of locking devices, while on delivery branches of compressors - check valves. Heating by compressors must be established/installed compressor receptacles, and after them - oil separators. Before the pumps must be provided for installation of filters with the blowoff candles. After pumps on the forcing primer lines of pumps should be provided for the blowoff candles, which can be united with the candles from the filters. Supply header from the pumps must be equipped by the safety bypass valves, connected with the pipeline from the reservoirs by bypass line.

2.62. Transmission from electric motors for drive of compressors should be provided for with the aid of elastic couplings or V-belt drive when their construction/design excludes possibility of sparking. During the use/application of V-belt drive its resistance must not exceed 6 meg.

The use/application of flat-belt transmission is not allowed/assumed.

#### PIPELINES OF LIQUEFIED GAS.

2.63. With planning of gas pipes of liquid and steam phases in territory of gas-distributing station one must consider demands of chapter SNIP II-g.14-62 "technological steel pipelines with conditional pressure to 100 kgf/cm inclusively. The norms of planning, "it straightened safety in the gas economy" Gosgortekhnadzor of the USSR and instruction of present chapter.

2.64. Packing of gas pipes of liquid and steam phases should be provided for, as a rule, above-ground, of steel seamless pipes on supports of their incombustible materials in height not less than 0.5 m above ground level.

2.65. Wall thickness of tubes should be relied on maxima



operating pressure, created in gas pipes of liquid or steam phases, taking into account external mechanical loads.

2.66. Connecting pieces on pipelines of liquefied gas should be provided for steel.

2.67. On pipelines of liquefied gases arrangement/position of any fittings in wells is not allowed/assumed.

2.68. Hydraulic design of pipelines of liquid phase of liquefied gas should be performed according to formula:

$$H = \lambda \frac{lW^3}{d^2g} \gamma, \quad (1)$$

where  $H$  - loss of head in section of gas pipe by length, equal to  $H$  in  $\text{kgf/m}^2$ ;  $d$  - bore of gas pipe  $\text{m}$ ;  $\lambda$  - coefficient of hydraulic resistance;  $l$  - length of pipeline  $\text{m}$ ;  $W$  - average speed of motion of liquefied gas in  $\text{m/s}$ ;  $g$  - acceleration of gravity in  $\text{m/s}^2$ ;  $\gamma$  - specific gravity/weight of gas in  $\text{kg/m}^3$ .

Taking into account the anticavitation reserve the average speeds of the motion of the liquid phase of gas  $W$  should be accepted:

a) in the inlet tubing - not more than 1.2  $\text{m/s}$ .

b) in delivery conduits - not more than 3  $\text{m/s}$ .

The coefficient of hydraulic resistance should be determined from the formula:

$$\lambda = 0,11 \left( \frac{K_s}{d} + \frac{68}{Re} \right)^{0,25}, \quad (5)$$

where  $d$  - bore of pipeline  $m$ ;  $K_s$  - equivalent absolute roughness of the wall of tube  $m$  (for steel seamless pipes  $K_s$  should be assumed equal to 0.0001);  $Re$  - Reynolds number.

2.69. Hydraulic design of pipelines of steam phase of gas must be produced in accordance with instructions of chapter SNIP II-g.13-62 "gas supply. External networks/grids and constructions. Norms of design".

2.70. For ground-based gas pipes of liquid phase in sections between tripping devices must be provided for protection from pressure increase in them as a result of heating from solar radiation. Depending on local conditions means of defense can be safety valves, coloration of pipelines into the white color, etc.

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SANITARY-ENGINEERING DEVICES.

2.71. Requirements of present section apply to design of systems of internal and external water supply, channelization, heating and ventilation of gas-distributing stations of liquefied gas.

Water supply.

2.72. During design of water supply of gas-distributing stations it is is guided by corresponding sections of following standard documents:

a) chapter SNIP II-g.2-62 "internal water pipe of production and auxiliary buildings of industrial enterprises. Norms of design";

b) chapter SNIP II-g.3-62 "Water supply. Norms of design";

c) the "sanitary norms of the design of industrial enterprises" (SN 245-63);

d) chapter SNIP II-A.5-62 "fire-fighting requirements. Basic condition/positions of design" and by the instructions of present chapter.

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2.73. Expenditure of water for external fire extinguishing of gas-distributing stations and stores of liquefied gases should be accepted on Table 10.

Table 10. Expenditure of water for external fire extinguishing.

(1) Общий объем резервуаров сжиженного газа в м <sup>3</sup>	(2) Расход воды в л/сек	
	(3) резервуа- ры, распо- ложенные на земле	(4) резервуа- ры, распо- ложенные под землей
До 200 включительно	15	7
До 1000 включительно	20	10
До 2000 включительно	40	20
Свыше 2000, но не более 3000	80	40

Note. With electrical supply of gas-distributing station from one power supply it is necessary to provide for the system of the additional fire-fighting water supply, which does not depend on the presence of electric power (for example, pumps with the internal combustion engines, etc.).

Key: (1). Total volume of the reservoirs of liquefied gas in m<sup>3</sup>. (2). Flow rate of water in l/s. (3). reservoirs, arranged/located on earth/ground. (4). reservoirs, arranged/located underground. (5). To. (6). inclusively. (7). It is higher than 2000, but not more than 3000.

2.74. In such a case, where in source of water supply accepted effective pressure provides height/altitude of compact jet and shank, arranged/located at the level of highest point of highest building or construction of gas-distributing station not less than 10 m, with flow rate per second of water, in accordance with data of Table 10,

connection of water pipe of gas-distributing station to selected source of water supply is provided for without any additional constructions at quite gas-distributing station.

2.75. With insufficient pressure or insufficient quantity of water in selected source of water supply for guaranteeing flow rate of water, according to Table 10, at gas-distributing station must be provided for pumping plant with storage tanks of fire-fighting water supply.

In the presence of two water lines, which feed water to the gas-distributing station, the volume of reservoirs one should accept from the calculation of three-hour, while with one water line - of the calculation of the six hour expenditure of water for extinguishing fires.

2.76. Distances from reservoirs of fire-fighting water supply to buildings and constructions of gas-distributing stations must comprise not less than 20 m, but to reservoirs with liquefied gases and of liquid drainage piers - not less than 40 m.

2.77. At gas-distributing stations, as a rule, must be provided for construction of circular network/grid of fire-fighting high-pressure water pipe.

In the presence of agreement with the local organs/controls of fire supervision at the gas-distributing stations in total volume of the tank farm to 200 m<sup>3</sup> it is allowed/assumed the system of fire-fighting water pipe not to provide for, but for the quenching of fires to accept the feed system of water is direct from the external water-conducting network/grid, the reservoirs or the basins.

2.78. For the purpose of savings of flow rate of water and decrease of quantity of effluents at gas-distributing stations one should provide for repeated use of water, supplied to cooling of compressors and other needs.

2.79. Distance between water pipe and pipeline of liquefied gases of gas-distributing stations with their underground parallel packing should be accepted in accordance with instructions of chapter SNIP II-g.13-62 "gas supply. Supply networks/grids and constructions. Norms of design".

2.80. For water-conducting wells in radius to 50 m of buildings and constructions of gas-distributing stations with productions, placed on explosiveness in categories V-1a and V-1g, they must be provided for on two covers/caps.

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#### Channelization.

2.31. During layout of channelization of gas-distributing stations it is to be guided by appropriate sections of following standard documents:

a) chapter SNIP II-g.5-62 "internal channelization of production and auxiliary buildings of industrial enterprises. Norms of layout";

b) chapter SNIP the II-g.6-62 "channelization. Norms of design";

c) "norms and technical specifications of designing of storage enterprises and economies for storing the inflammable and flammable liquids" (NITU 108-56);

d) the "sanitary norms of the design of industrial enterprises" (SN 245-63) and instructions of present chapter.

2.32. Derivation after hydraulic tests of the communications of gas-distributing static or ore washer of reservoirs, tank cars or



bottles, and also water, which is accumulated/stored in the embanked territory of the tank farm, should be provided for into the channelization through the special sump whose construction/design must exclude the possibility of the incidence/impingement of liquefied gas into the channelization.

2.33. Branch/removal of production effluents from territory of gas-distributing station, and also water from washing of motor vehicles and parts in machine shops must be provided for in accordance with requirements of "sanitary norms of design of industrial enterprises" (SN 245-63).

In all cases the projects of jettisoning production water from the territory of gas-distributing station must be matched with the organs of main sanitary-epidemiological control of the Ministry of Public Health of the USSR and the local organs/controls of municipal services.

2.34. Besides production channelization at gas-distributing station must be designed domestic-human waste channelization for branch/removal of domestic-human waste water, which come from showers, wash-stands, gas inclusions, washings, toilets, etc.

The branch/removal of the domestic-human waste flows should be

provided for into the network/grid of urban domestic-human waste channelization or to the local cleaning constructions. The connection of the domestic-human waste channelization to the production channelization without the preliminary purification of the domestic-human waste flows is not allowed/assumed. On the productions of production channelization from the buildings it is necessary to provide for the construction of wells with the water locks.

2.85. For channelization wells in radius to 50 m of buildings and constructions of gas-distributing stations with productions, belonging with respect to explosiveness to categories V-1a and V-1g, they must be provided for on two covers/caps, but in space between covers/caps - filling by sand to height of not less than 0.15 m.

Heating and ventilation.

2.86. During design of heating and ventilation at gas-distributing stations it is to be guided by appropriate sections of following standard documents:

a) chapter SNIP II-g.7-62 "heating, ventilation and air conditioning. Norms of design";

b) chapter SNIP the II-g.10-62 "thermal networks/grids. of the

norm of design";

c) the "sanitary norms of the design of industrial enterprises" (SN 245-63) and by the instructions of present chapter.

2.87. In production locations of gas-distributing stations must be provided for central heating. As the heat carrier in the heating system can be used hot water, low-pressure steam or the heated air.

Note. The use/application of complete or partial recirculation of air for the hot-air heating of dangerously explosive locations is not allowed/assumed.

2.88. Pipe laying of heating systems production indoors must be provided for by that order.

2.89. For all dangerously explosive closed locations of gas-distributing station must be provided for systems of suction and exhaust ventilation with mechanical stimulation.

2.90. Productivity of ventilation systems on inflow and drawing should be determined in quantity of harmfulness, which enter locations. In the absence of the data about a quantity of separating production harmfulness the productivity of ventilation systems is

allowed/assumed to determine on the multiplicity of exchange of air in the locations.

2.91. Multiplicities of exchange of air in production locations of gas-distributing station with productions, placed on fire hazard in category A, must be provided in sizes/dimensions, given in Table 11.

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Table 11. Multiplicities of exchange of air in the production locations of gas-distributing station.

Наименование помещений	Кратность воздухообмена в рабочее время в ч	Кратность воздухообмена в не-рабочее время в ч
Производственные помещения с производствами, отнесенными по пожарной опасности к категории А (например, насосно-компрессорное, наполнительное, сливное, промывки баллонов, газификации и т. п.)	10	3

Key: (1). Designation of locations. (2). Multiplicity of exchange of air in operating time in h. (3). Multiplicity of exchange of air in idle time in h. (4). Production locations with productions, placed on fire hazard in category A (for example, pump-and compressor, filler, drainage, ore washers of bottles, gasification, etc.).

2.92. During design of exhaust ventilation of basic production locations of gas-distributing stations must be provided for drawing from lower zone  $2/3$  and from upper zone of  $1/3$  removed air from location.

2.93. In unheated production areas of gas-distributing stations in which service personnel is situated variably, can be provided for natural ventilation by through aeration through louvered grates which should be furnished in lower part of opposite walls.

2.94. Exhaust ventilation of production shops of gas-distributing stations can be provided for by general/common/total for all locations with productions, in reference on fire hazard to one category, or independent for each location, taking into account demands of chapter SNIP II-9.7-62 "heating, ventilation and air conditioning. Norms of design".

2.95. In filler department/separation in floor/space must be provided for air exhaust from wiring points of bottles, filler and drainage ramps. The speed of air circulation in the clear opening of suction should be accepted from 1.2 to 1.5 m/s.

2.96. For locations, in which is furnished ventilation equipment (ventilation chambers/cameras), must be provided for natural

ventilation with single exchange of air in hour.

2.97. Equipment and apparatus for exhaust ventilation systems, provided for for ventilation or dangerously explosive locations, is to accept in explosion-proof performance.

Monitoring and measuring instruments, safety and close fitting valve.

2.98. During design of gas-distributing stations should be applied monitoring and measuring instruments, and also gauging, safety and close fitting valve, suitable to work in medium of liquefied gases and designed for those corresponding temperature and pressure. Equipment must be steel or from the malleable cast iron. Fittings from gray cast iron is allowed/assumed to the use/application only or low-pressure pipelines. Cast iron reinforcement must not be provided for to installation up in the places where it can be subjected to the vibration or other mechanical effects.

2.99. For underground and ground-based reservoirs of gas-distributing stations they must be provided for:

a) liquid level gauges;

b) manometers (not cylindrical reservoirs one, in upper part, on spherical ones two: below and in upper part of reservoir);

c) safety valves;

d) drain valves.

2.100. Manometers also must be provided for to installation on drainage devices, on reservoirs of basis of storage of gas, on plenum and inlet tubing of pump-and compressor department/separation and on servicing columns.

2.101. Liquid level gauges must be used type of slipping tube, fixed/recorded of level-gage tubes, magnetic type, float, etc.

2.102. Accepted for installation liquid level gauges with open type level-gage glasses must be designed for pressure not less than 18 kgf/cm<sup>2</sup>, equipped by high-speed/high-velocity locking automatic valves, by stop cocks and they are shielded by metal casing.

2.103. Safety valves one should provide for to installation up on each ground-based and buried tank in accordance with requirements of "rules of device and safe operation of vessels, which work under pressure", affirmed by Gosgortekhnadzor of USSR, and by instructions

cf present chapter.

2.104. Height/altitude of outflow tubes (candles) from safety valves, adjusted on reservoirs, must be accepted not less than 3 m, counting this distance in ground-based reservoirs from operating area/site, but in buried tanks - from surface of mound.

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2.105. Determination of throughput capacity of safety valves of ground-based reservoirs should be produced on maximum calculated volatility of liquefied gas, on the basis of conditions of greatest heating of reservoir in the case of fire.

The flow passage cross-sectional area safety valve should be determined from the formula

$$F = \frac{G}{220p \sqrt{\frac{M}{T}}}, \quad (6)$$

where  $F$  - flow passage cross-sectional area of valve in  $\text{cm}^2$  (req)

$G$  - the throughput capacity of valve in  $\text{kg/h}$ ;

$p$  - maximum absolute pressure in  $\text{kg/cm}^2$ ;



T - absolute temperature of vapors of liquefied gas in °K;

M - molecular weight of the steam phase of liquefied gas in kg.

Note. Under the maximum calculated volatility is accepted the quantity of liquefied gas in kg, which can be vaporized for 1 h due to the heat, obtained by reservoir from the environment at temperature on the order of 550-650°C (during the fire) with the maximum filling of reservoir.

During the underground arrangement of the reservoirs of the flow passage cross-sectional area of safety valves should be taken as the equal to 300% of those required for the reservoirs during the ground-based arrangement.

The flow area of safety valves must provide also the passage of entire amount of liquid, supplied with pumps to the reservoirs with their peak output.

2.106. For evaporative and mixing of installations of liquefied gas, located in locations gas-distributing stations without permanent stay of service personnel, must be provided for duplicating control displays of technological processes with their arrangement/position

in locations with service personnel.

2.107. For mixing of installations of liquefied gas with air must be provided for automatic gas analyzers, calorimeters and instruments, which check specific gravity/weight of mixed gas (required relationship/ratio of mixture of gas and air).

On the pipelines of gas and air flow, which enter the mixing, must be provided for the pockets for installation of thermometers.

2.108. In dangerously explosive locations of gas-distributing stations where they can take place of liquefied gases, should be provided for instrumentation, which signal about dangerous concentration of gas in air of locations.

In the absence of the instruments indicated it is necessary to provide for the weekly conducting of the analyses of air of locations to the content in it of gas.

### 3. Auto-servicing stations of liquefied gas.

3.1. For servicing of gas-tankers, which work on liquefied gas, in projects of gas supply of cities should be provided for building of auto-servicing stations of liquefied gas, arranged/located in

limits of urban feature.

3.2. In composition of auto-servicing stations of liquefied gas are provided for: reservoirs (in accordance with p. 2.40), compressor, intended for creation of necessary pressure reserves, pumps for pumping of liquefied gas from reservoirs into automobile bottles, servicing columns, pipelines of liquid and steam phases of liquefied gas.

For the pump-and compressor department/separation is provided for the building in which is placed the dispenser of automobiles. The calculation of power of auto-servicing stations is produced according to a number of servicing automobiles in a 24 hour period.

3.3. Requirements for buildings and constructions of auto-servicing stations must be in accordance with requirements, presented to buildings and constructions of gas-distributing stations, presented in present chapter.

3.4. Maximum volume of group of reservoirs of auto-servicing station of liquefied gas, arranged/located in the range of urban feature, must not exceed 100 m<sup>3</sup>, but volume of one reservoir - 25 m<sup>3</sup>.

Erection of tank is allowed, assumed only underground.

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3.5. Minimum distances from buried tanks of liquefied gas of auto-servicing station, arranged/located in the range of urban feature, to buildings, which do not relate to station, should be accepted on Tables 12.

Table 2. Minimum distances from the buried tanks of the liquefied gas of the auto-servicing station, arranged/located in the range of urban feature, to buildings not belonging to the auto-servicing station.

1/ Наименование зданий и сооружений	2/ Расстояние в м
Общественные здания, независимо от степени огнестойкости (например, театры, кинотеатры, клубы, Дома культуры, лечебные и детские учреждения, учебные заведения, рынки, железнодорожные платформы, станции городского транспорта и т. д.) . . . . .	50
Жилые, промышленные и другие здания и сооружения, в независимости от степени огнестойкости . . . . .	50

Key: (1). Designation of buildings and constructions. (2). Distance in m. (3). Public buildings, independent of degree of refractoriness (for example, theaters, cinemas, clubs, houses of culture, therapeutic and children's institutions, educational institutions, markets, flatcars, stations of urban transport, etc.). (4). Habitable, industrial and other buildings and constructions, in independence from degree of refractoriness.

3.6. Distances from reservoirs of liquefied gases to buildings of pump-and compressor department/separation, and also to railway lines and highways, which relate to auto-servicing station, must be provided for on Table 5, on graph/count 3.

3.7. For servicing of working on liquefied gas tractors, combines and other agricultural machines, and also for filling of bottles for domestic demand in places, removed from stationary gas-distributing stations, can be provided for tank cars of special construction/design.

The design of installations for these purposes must be produced in accordance with the indications of the design of gas-filling points/items from the tank cars.

4. Gas-filling points/items and intermediate storages of the cylinders of liquefied gas (points/items of the exchange of cylinders).

4.1. Gas-filling points/items and intermediate storages of cylinders are intended for supply with liquefied gas in cylinders of communal general, agricultural and other users, who are located in populated areas and on objects, distant from gas-distributing stations.

4.2. Supply of liquefied gas to gas-filling points/items and intermediate storages of cylinders should be provided for from gas-distributing stations.

The transport of gas should be provided for:

a) to the gas-filling points/items - in the tank cars of special construction/design;

b) to the intermediate storages of cylinders - on the automobiles, equipped for the transportation of cylinders.

4.3. On gas-filling points/items must be provided for following operations: filling with liquefied gas of cylinders from tank cars, drain from cylinders of unevaporated remainders/residues of liquefied gas, delivery/procurement of those filled, replacement and collection of empty cylinders from users.

On the intermediate storages of cylinders should be provided for only the delivery/procurement of those filled, replacement and collection of empty cylinders.

4.4. Productivity and radius of action of gas-filling points/items and intermediate storages of cylinders should be set to technical and economic considerations.

4.5. Arrangement of gas-filling points/items and intermediate storages of cylinders should be provided for in outskirts of

populated areas, predominantly from windward face for winds of predominant direction with respect to existing structures.

It is necessary that near the arrangement of gas-filling points/items and intermediate storages of cylinders would be located the highways, which make it possible to provide the uninterrupted motion of heavy duty tank cars and automobiles with the cylinders for transporting of liquefied gas.

4.6. Buildings and constructions of gas-filling points/items and intermediate storages of cylinders should be projected/designed in accordance with demands paragraphs of 2.19-2.23 present chapters.

4.7. Distances from constructions of gas-filling points/items to habitable and public buildings should be accepted not less than 100 m, and to production buildings of industrial and municipal enterprises - not less than 20 m.

Distances from the intermediate storages of the cylinders of liquefied gases to the adjacent production, habitable and public buildings one should provide for in accordance with Table 20 of the "rules of device and safe operation of the vessels, which work under the pressure", affirmed by Gosgortekhnadzor of the USSR.



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4.8. In designs of gas-filling points/items and intermediate storages of cylinders should be provided for construction of areas/sites for storing empty and filled with liquefied gas cylinders.

Areas/sites must be light type, from incombustible materials, with the loftless roofs.

Area for the storing of the empty and filled with liquefied gas cylinders should be determined:

a) for the gas-filling points/items - from the calculation of the 48-hour productivity of feeding devices;

b) for the intermediate storages of cylinders - from the calculation of storage 250/o quantity of cylinders of the serviced cylinder of installatics. up.

When justified is allowed/assumed an increase in the calculated quantity of cylinders for the storage on the gas-filling points/items and the intermediate storages of cylinders with the observance of the corresponding intra-area breakage between the areas/sites for storing

the cylinders and the buildings and the constructions.

4.9. Areas/sites on gas-filling points/items and intermediate storages of cylinders, intended for storing empty and filled with liquefied gas cylinders, follows to plan and to place in territories of points/items in accordance with requirements for locations, dangerous in relation to explosion and also requirements of corresponding section of "rules of device and safe operation of vessels, which work under pressure", affirmed by Gosgortekhnadzor USSR.

#### 5. Cylinder and reservoir settings up of liquefied gas.

5.1. Cylinder and reservoir of installation of liquefied gas are supplemented by liquefied gas from gas-distributing stations and are intended for gas supply of different users of gas in area of action of gas-distributing station.

#### CYLINDER SETTINGS UP OF LIQUEFIED GAS.

5.2. Cylinder of installation depending on productivity can be projected/designed both individual and group.

#### INDIVIDUAL CYLINDER SETTINGS UP.

5.3. Individual cylinder of installation should be considered installation of gas supply, which has not more than two cylinders, intended for gas supply of users with small flow of gas (for example, everyday needs of habitable houses, public buildings, etc.).

Installation of cylinders with the liquefied gas it is allowed/assumed to provide for both inside and outdoors.

5.4. During design of individual cylinder of installation with arrangement/position of cylinders in buildings and placements arrangement of cylinders must be provided for in the same locations where are placed devices, which consume gas (for example, gas stoves, trivets, etc.).

The locations in which is provided for the arrangement/position of the instruments, which consume gas, and gas containers must satisfy requirements for similar locations, indicated in chapter SNIP the II-g.11-62 "gas supply. Internal gas equipment. Norms of design".

To provide for the arrangement/position of gas containers in the base and basement decks of buildings and constructions, and also in the locations, under which there are basements and cellars with the

entry from this location, is not allowed/assumed.

Installation of gas containers in the living rooms is not allowed/assumed.

5.5. In habitable and public buildings in one location it is allowed/assumed to provide for arrangement/position of one cylinder capacitance than not 55 l, while in production locations of one cylinder capacitance than not 80 l for one assembly which consumes liquefied gas.

5.6. The air temperature in locations where cylinders of liquefied gas are to be stored must not be higher than 45°C.

If necessary for installation of cylinders at a temperature of air in the production location of higher than 45°C must be provided for the use in the cylinders of the mixture of technical propane with butane, by saturation pressure not above 16 kg/cm<sup>2</sup>. Furthermore, in such cylinder installations it is necessary to provide for the setting up of safety valves.

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5.7. In kitchens of habitable buildings, in kitchens also of preparator points/items of feeding, public buildings of installation of gas containers should be provided for on floor/sex in places accessible for inspection and replacing cylinders. Fastening

cylinders must be provided for to the wall. The construction/design of fastening must allow the rapid disconnection of cylinder.

Minimum distance from the cylinders to gas plates, the trivets, the radiators of central heating, furnaces and other equipment, which consumes gas, should be accepted not less than 1 m. The distance indicated can be reduced to 0.5 m, if is provided for installations at a distance not less than 10 cm from the cylinder of shield, which shields it from the heating.

Arrangement in the locations of gas containers indicated against the furnace doors of furnaces is not allowed/assumed, if the distance between them less than 2 m.

Notes: 1. It is allowed/assumed to provide for the arrangement/position of cylinders in immediate proximity or inside the gas instruments of prefabrication; in this case structurally/constructively the installation up must provide the temperature of heating the wall, which separates/literates cylinder from the gas burners, not higher than 45°C.

2. During use of plates/slats with built-in cylinders is allowed/assumed storage in kitchen or preparatory two cylinders capacitance than not 27 l each (one of them standby).

5.8. In industrial enterprises installation of gas containers should be provided for in places, safe from damage by intraship transport, safe ones from spatters of metal and effect of corroding liquids and gases, and also from effect of high temperatures. Installation of cylinders it is allowed/assumed to provide for directly in the aggregates/units, which consume gas, if this is provided for by the construction/design of aggregate/unit.

5.9. During arrangement/position of cylinders outdoors it is necessary to consider possibility of natural evaporation of liquefied gases in winter time. 9 Installation of gas containers out of the buildings should be provided for in the locking cabinets or under the locking jackets, which close the upper part of the cylinders and reducer.

In the cabinets and the jackets must be provided for the slots and louvered grates for the aeration.

Installation of cylinders in the walls of buildings must be provided for not nearer than 0.5 m of doors and windows of first deck and 3 m of windows and doors of base and basement decks, channelization wells and cesspools.

5.10. Arrangement/position of cylinders of individual cylinder installation on the side of main facades of buildings and in passages with intense motion of transport is not allowed/assumed.

5.11. Installation of cabinets for cylinders must be provided for to incombustible bases/roofs, which eliminate sag, with their fastening to bases/roofs or to walls of buildings. The height/altitude of base/roof under the cabinets above ground level should be accepted not less than 10 cm.

5.12. During installation of cylinders outdoors it is necessary to provide for conditions, which prevent heating cylinders more than 45°C. For these purposes the installations of gas containers should be provided for on the shadow side of buildings and constructions. If necessary installation of cylinders on the sunny side of buildings and constructions should be provided for shade protection of cylinders or arranged the mounting fixture.

5.13. Arrangement/position of cylinder of installation, used for supply with liquefied gas of cattle-breeding and poultry-breeding farms/trusses, should be provided for out of buildings. For installation of the gas supply of hot-houses and greenhouses, which

have ventilation, it is allowed/assumed to provide for the arrangement/position of cylinders indoors.

5.14. For guarantee with gas of users on seasonal agricultural works (for example, drying of grain, vegetables, heating of gardens, burning out of weeds, fight with wreckers of agricultural plants, etc.) should be provided for movable or movable cylinder of installation of liquefied gases.

The designs of movable and movable cylinder of installation must be matched with the organs/controls of Gosgortekhnadzor in the routine.

5.15. Pressure regulator (gas regulator) one should to provide for in cylinder of installation for reducing/descending outlet pressure of gas, which enters from cylinders distributive network:

a) household devices - to 200-360 mm of water levels. H<sub>2</sub>O col.

b) production aggregates/units - to level in accordance with their technological mode/conditions.

Installation indoors of cylinders with the reducers, which foresee jettisoning gas from the safety valve of reducer, is



allowed/assumed under branch condition for the jettisonable gas beyond the limits of the locations through the candles.

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5.16. Design of pipelines of individual cylinder of installation should be produced with observance of demands of chapter SNIP II-g.11-62 "gas supply. Internal gas supply. Norms of design".

The packing of pipings for the steam phase of liquefied gas should be provided for with the draft/gradient to the side of cylinders. The height/altitude of pipelines from the floor/sur indoors must be accepted not less than 0.7 m (at the level of frame of gas stove).

Note. Is allowed/assumed the decrease of the height/altitude of the packing of gas pipe from the floor/sur of location to 0.1 m in the individual sections (for example, with the enclosure of the heaters of the systems of central heating) in the absence in these sections of tripping devices.

5.17. Feeding gas pipes from individual cylinder of installation should be, as a rule, provided for from steel tubes, in accordance with demands of chapters SNIP II-g.11-62 "gas supply. Internal gas

supply. Norms of design" and the I-g.8-62 "gas supply. Internal devices. Materials, equipment, reinforcement and part".

Note. The possibility of use/application for the feeding gas pipes of nonmetallic tubes in each individual case must be coordinated with the organs/controls of Gosgortekhnadzor.

5.18. For connection of gas instruments of everyday usage and production aggregates/units to cylinders, placed in locations, is allowed/assumed use/application of rubber-fabric hoses/pipes, manufactured according to GCST 8318-57 type E to operating pressure to 10 kg/cm<sup>2</sup> or according to 9356-60 types GCST II to operating pressure to 6 kg/cm<sup>2</sup>.

Rubber-fabric hoses/pipes must be without the connections and have a length:

- a) for the connection of household gas devices - to 10 m;
- b) for the connection of production aggregates/units - to 15 m.

5.19. Packing of connecting rubber-fabric hoses/pipes to stationary gas instruments of everyday usage it is allowed/assumed to provide for on walls of locations with fastening of hoses/pipes with

the aid of special brackets. It is forbidden to provide for the packing of rubber-fabric hoses/pipes through the walls, the doors, windows, etc.

To the production aggregates/units can be provided for the packing of rubber-fabric hoses/pipes on the walls of locations, on the special supports or on the floor/sex, in the places, safe from the damages, which do not mix the motion of the people, transport and accomplishing production processes.

#### GROUP CYLINDER SETTINGS UP.

5.20. Group cylinder installation should be considered installation of gas supply in which there are more than two cylinders, intended for temporary/time gas supply of different users.

5.21. Group cylinder installation it is allowed/assumed to provide for for gas supply of objects only in exceptional cases, if there are no reservoirs for equipment of reservoir of installation. up. In the design of group cylinder installation up should be provided for possibility and periods of the replacement by their reservoir of installation if necessary.

5.22. In group cylinder of installation they must be included:

- 1) cylinders;
- 2) high-pressure collector/receptacle;
- 3) pressure regulator (reducer) and regulator-switch automatic;
- 4) general/common/total tripping device;
- 5) manometer (showing);
- 6) safety valve, after pressure regulator on low side;
- 7) gas pipes.

Notes: 1. When in pressure regulator the built-in safety valve is present, installation of additional valve is not required.

2. To group of cylinders, which consists of two cylinders and more, should be provided for installation of one pressure regulator.

5.23. Required quantity of working cylinders in group cylinder installation, intended for gas supply of habitable buildings, should

be determined from formula:

$$N = \frac{nqK_0}{Q_n V} \quad (7)$$

where N - quantity of working cylinders in group cylinder installation in pcs;

n - quantity of supplied with gas apartments;

q - nominal thermal load of gas instruments, established/installed in one apartment, in kcal/h;

$K_0$  - diversity factor, taken in accordance with chapter SNIP II-g.11-62 "gas supply. Internal gas supply. The norms of design";

$Q_n$  - lowest heat of combustion of gas in kcal/nm<sup>3</sup>;

V - design capacity on the gas of one cylinder in nm<sup>3</sup>/h, determined on the nomogram, given in appendix 1.

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Note. The required quantity of working cylinders in the group cylinder installation intended for the gas supply of the users of gas in the municipal and industrial enterprises and on the agricultural

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objects, should be determined from formula (7). In this case

$$nq = q_{\text{total}} = q_1 + q_2 + \dots + q_n,$$

where  $q_1, q_2, \dots, q_n$  - nominal thermal load of the gas aggregates/units, established/installed in the enterprise or object, in kcal/h;

$n$  - quantity of aggregates/units, which consume gas;

$K_0$  - one should accept in accordance with the specific working conditions of the aggregates/units, which consume liquefied gas.

5.24. Total storage capacity of group cylinder installation for habitable, public buildings and communal general users must not exceed:

- a) during arrangement/position in walls of buildings - 600 l;
- b) during arrangement/position with breakage from buildings, according to tables 13, - 1000 ~~l~~ l.

5.25. Total storage capacity of group cylinder installations for industrial and municipal enterprises must not exceed:

- a) during arrangement/position in walls of buildings - 1000 l;

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b) during arrangement/position with breakage from buildings,  
according to tables 13,-1500 ~~and~~ 1.

5.26. Minimum distances from group cylinder installations to  
habitable, public and production buildings, depending on degree of  
refractoriness, should be accepted on Table: 13.

Table 13. Minimum distances from the group cylinder installations to the buildings of different designation/purpose.

Характеристика зданий и сооружений	Расстояние в м
Жилые, производственные здания промышленных предприятий и другие здания и сооружения:	
1 и II степени огнестойкости . . . . .	8
III степени огнестойкости . . . . .	10
IV и V степени огнестойкости . . . . .	12
Общественные здания вне зависимости от степени огнестойкости (например, больницы, детские учреждения, кинотеатры, клубы, Дома культуры, учебные заведения и др.)	25

Key: (1). Characteristic of buildings and constructions. (2).

Distance m. (3). Habitable, production buildings of industrial enterprises and other buildings and constructions. (4). I and II degrees of refractoriness. (5). III degree of refractoriness. (6). IV and V degrees of refractoriness. (7). Public buildings without depending on degree of refractoriness (for example, hospital, children's institutions, movie theatres, clubs, houses of culture, educational institutions, etc.).

5.27. Arrangement/position of group cylinder installations without breakage from buildings are permitted only in anechoic incombustible walls of buildings (in walls, which do not have windows and doors).

Distance from the group cylinder installations to the wells and



the cesspools should be accepted not less than 5 m.

5.28. Arrangement/position of group cylinder installations up should be provided for in cabinets or special booths from incombustible materials. Installations of cabinets, booths and cylinders must be provided for on the foundations.

Around the foundation of cabinet or booth is provided for the blind area in wide not less than 0.5 m.

5.29. If necessary of guaranteeing stable evaporation of liquefied gas without depending on external temperature conditions is allowed/assumed arrangement/position of group cylinder installations in special structure or in annex to anechoic external wall of production location.

Special structures or annexes for positioning/arranging the group cylinder installation must be provided for by single-stage ones from the incombustible materials, with light type coating, floors/sexes and without the garret. Windows and doors should be opened/disclosed outside. In these locations should be provided for:

a) water ones or low-pressure steam ones of the system of central heating with the local heaters;

b) the systems of natural or mechanical ventilation, which ensure quintuple exchange of air in the location in the hour. Drawing must be provided for fixed the lower and upper zones of location:

c) electrical illumination in the explosion-proof performance.

The temperature of air in the locations of special structures or annexes for positioning, arranging the group cylinder installations should be accepted in accordance with the demands of chapter SNIP the II-g.7-62 "heating, ventilation and air conditioning. Norms of design".

Note. During the use/application for the flow of air into the locations where are placed group cylinder installations the systems of mechanical ventilation should be for the heating of locations provided for the systems of the hot-air heating, combined with the ventilation.

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5.30. Reservoir installations should be considered installations of gas supplies, which contain two and more than reservoir for liquefied gas, intended for supply with liquefied gas of different users.

5.31. Reservoir installations must contain:

- a) reservoirs;
- b) conduits/manifolds of trace of reservoirs;
- c) close fitting valve;
- d) pressure regulators of gas;
- e) safety valves (locking and outflow);
- f) manometers (showing), adjusted before and after pressure regulator of gas;

g) level indicators of liquefied gas in reservoirs.

Note: It is envisaged that the liquefied-gas level indicator will be common for the entire group of reservoirs which communicate through the liquid phase.

In the project one should provide that fittings of reservoir installations must consist into metal locking jackets with the cuts for the ventilation. for by general/common/total to entire group of the imparted on the liquid phase reservoirs.

5.32. Reservoir installations can be provided for both with ground-based and underground erection of tank.

The ground-based installation of reservoirs should be applied for the reservoir installations intended for the gas supply of industrial enterprises and enterprises of agricultural production.

The underground erection of tank should be applied for the reservoir installations intended for the gas supply of both industrial and municipal enterprises and habitable and public buildings and, the objects of agriculture.

5.33. Arrangement/position of reservoir installations should be provided for on pads with convenient entrance for heavy duty tank cars with liquefied gas and another form of motor transport.

In the designs of reservoir installations it is necessary to provide for the enclosure/protection of areas/sites from the incombustible materials.

Distance from the reservoirs to the enclosure/protection should be accepted not less than 1 m.

5.34. Required quantity of reservoirs of reservoir installation should be determined, being guided by indications, given in appendix 2. The productivity of the buried tanks of liquefied gas should be determined on the nomograms, given in appendices 2 and 3. productivity on the gas of the ground-based available reservoirs should be determined by calculation on the natural volatility of gas due to heat which enters from the environment.

5.35. Maximum total geometric volume of reservoirs of group reservoir installation should be provided for:

a) during ground-based arrangement of reservoirs for gas supply of industrial enterprises - 20 m<sup>3</sup>;

b) during underground arrangement of reservoirs for gas supply

of habitable, public, communal general and industrial users - 50 m<sup>3</sup>.

5.36. Maximum volume of one reservoir should be accepted:

a) during ground-based and underground arrangement of reservoirs in total geometric volume to 20 m<sup>3</sup> - not more than 5 m<sup>3</sup>;

b) during underground arrangement of reservoirs in total geometric volume of installation 21-50 m<sup>3</sup> - more than 10 m.

5.37. Minimum distances from ground-based reservoirs to buildings of industrial enterprises must comprise:

a) for reservoirs in geometric volume 0.1-2 m<sup>3</sup> - 25 m;

b) for reservoirs in geometric volume 2.1-4 m<sup>3</sup> - 40 m.

5.38. Minimum distances from buried tanks to buildings and constructions must be accepted in accordance with Table 14.

**Table 14. Minimum distances from the buried tanks to the buildings and the constructions of different designator/purpose.**

1 Характеристика зданий и сооружений	2 Расстояния в м при общем геометрическом объеме резервуаров в м <sup>3</sup>		
	3 до 10	11-20	21-50
4 Общественные здания, вне зависимости от степени огнестойкости (например, больницы, детские учреждения, кинотеатры, клубы, дома культуры, учебные заведения и др.)	25	25	50
5 Жилые, производственные здания промышленных предприятий и другие здания и сооружения:			
6 а) I и II степеней огнестойкости	8	10	15
7 б) III степени огнестойкости	10	12	20
8 в) IV и V степеней огнестойкости	12	15	25

Key: (1). Characteristic of buildings and constructions. (2).

Distances in with total geometric volume of reservoirs in m<sup>3</sup>. (3). to.

(4). Public buildings without depending on degree of refractoriness

(for example, hospital, children's institutions, cinemas, clubs,

houses of culture, educational institutions, etc.). (5). Habitable,

production buildings of industrial enterprises and other buildings

and constructions: (6). I and II degrees of refractoriness. (7). III

degree of refractoriness. (8). IV and V degrees of refractoriness.

arranged/located reservoirs of liquefied gas of reservoir installations to underground and ground-based utility networks of communications (for example, conduits/manifolds of water supply of channelization, gas supply, air electric power lines [VL], power cables and communication cables, etc.) should be accepted on appropriate standard documents.

In the absence of their established, installed by standard documents distances one should accept according to the agreement with the organs/controls of supervision (for example, the organs of Gosgortekhnadzor [State Committee of the Council of Ministers for Supervision of Industrial Safety and for Mining Inspection (GSRsfr)], control of fire protection, etc.) and interested organizations.

5.40. Installation of buried tanks, their insulation/isolation and equipment should be provided for in accordance with demands paragraphs of 2.51-2.57 present chapters.

5.41. Installation of surface reservoirs and their equipment should be provided for in accordance with requirements of pp 2.39-2.42 of this chapter.

5.42. Provided for in projects monitoring and measuring



instruments, gauging, shielding and close fitting valve of reservoir installations must be designed for maximum vapor pressure of liquefied gases, but not less than on 16 kg/cm<sup>2</sup>.

5.43. Installation of safety valves it is to provide for on each reservoir, and during unification of reservoirs (in section on liquid and steam phases) - on one of reservoirs of section.

The calculation of safety valves should be performed in accordance with the indications of 2.105 present chapters.

5.44. Safety valves it is necessary to provide for:

a) locking-safety valve with impulse/momentum/pulse from low pressure (after pressure regulator) - to pressure regulator;

b) outflow safety valve - after pressure regulator.

Note. When in pressure regulator safety valve is present, the installation of separate safety valve after pressure regulator to provide for it is not necessary.

5.45. Pressure regulators, provided for in installation on conduits/manifolds of reservoirs, must correspond to operating

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pressure in reservoir and have throughput capacity on 10-15o/o of more maximum gas flow.

5.46. As close fitting valve in reservoir installations must be used catches, taps/cranks and valves/gates, manufactured from steel, ductile cast iron and bronze, suitable for work in medium of liquefied gases and designed for appropriate pressures.

5.47. Manometers on reservoirs should be established to pressure regulator.

After pressure regulator it is necessary to establish laboratory tap/crane for the connection of the U-tube gauge.

5.48. level indicator of liquid phase of liquefied gas should be provided for to installation on each reservoir, and during their unification in section - to head of one of reservoirs of section.

Level indicators must correspond to the demands paragraphs of 2.101 and 2.102 present chapters.

Conduits/manifolds of the group cylinder and reservoir settings up of liquefied gas.

5.49. Pipes of group cylinder and reservoir installations should be projected/designed, being guided by instructions of chapters SNIP II-G.11-62 "Gas supply. Internal gas equipment. Norms of planning" and II-G.13-62 "Gas supply. external networks/grids and constructions. the norms of planning", and also by the requirements of present section.

5.50. Pipes of steam phase of liquefied gas from ground-based reservoir and group cylinder installations placed with breakage from buildings, can be provided for its packing both underground and it is ground-based when ground-based packing will not prevent motion of transport and will not disturb architectural appearance of buildings.

5.51. Conduits/manifolds of steam phase of liquefied gas from underground reservoir installations to habitable and public buildings must be provided for its packing underground. In the territory of industrial and agricultural enterprises it is allowed/assumed to provide for the above-ground pipe laying of steam phase in accordance with the requirements p. 5.50, and also on the walls of production buildings.

The pipe laying of the liquid phase of liquefied gases it is allowed/assumed to provide for only on the walls of that building, in which the gas is consumed.

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5.52. During unification of bottles and reservoirs in section on conduits/manifolds of steam phase must be provided for to installation of disconnecting device in each section.

Note. With the underground pipe laying disconnecting device must be carried out to the earth's surface.

5.53. For installations of agricultural production of seasonal character (for example, drying of agricultural crops, heating of gardens, vegetable-gardens, etc.) is allowed/assumed to provide for connection of burners with the aid of rubber-fabric hoses/pipes in accordance with demands of 5.18-5.19 present chapters in long to 15 m, and also ground-based packing of temporary conduits/manifolds over earth's surface in places, safe from damage by transport, and with necessary testing of conduits/manifolds on density.

6. the evaporative and mixing settings up of liquefied gas.

6.1. Evaporative installations are intended for evaporating (regasification) of liquefied gas out of reservoirs in special

vaporizers/evaporators with use of heat of any heat carrier.

6.2. Evaporative installations should be provided for in following cases:

a) when underground or ground-based group reservoir installations during natural evaporation they cannot ensure necessity for gas of aggregates/units and instruments, which consume liquefied gas;

b) when by conditions for technological process necessarily constancy of composition of gas according to calorific value and by specific gravity/weight;

c) when it is necessary reliability of guarantee with gas of installations, gas-fired during sharply varying load of consumption of gas;

d) when in winter time it is utilized liquefied gas of composition of summer brands/sorts.

6.3. In content of equipment of installations of regasification should be switched on feed tanks, vaporizers/evaporators, safety and regulating units, manifold of gas and feed system of heat carrier.

6.4. Brace conduits/manifolds of installations of regasification and arrangement/position of locking, safety and gauging devices must exclude possibility:

a) freezing of utilized as heat carrier liquid;

b) output/yield of liquid phase from installation of regasification in conduit/manifold of gas phase;

c) pressure increases of gas and liquid than higher accepted for feed tanks.

6.5. As heat carrier for vaporizers/evaporators of liquefied gases can be used hot water, steam, electric heating, inert gases and hot oils, and also other analogous heat carriers.

6.6. Installation of vaporizers/evaporators should be provided for on open pads not nearer than 10 m of feed tanks, or in buildings where occurs use of gas, or in annexes and by them, also, in locations, specially intended for production and distributing gas.

Vaporizers/evaporators by productivity to 100 kg of gas in the

hour are allowed to be placed directly on the heads of the feed tanks.

The design of evaporative installations for regasification of liquefied gas in the basest locations is not allowed/assumed.

The vaporizers/evaporators, adjusted on the open pads, must be heat-insulated.

During the group arrangement/position of the vaporizers/evaporators of the distance between them should be taken as the equal to the diameter of the greatest vaporizer/evaporator, but not less than 1 m.

6.7. Mixing installations are intended for obtaining mixtures of liquefied gases with air or with low-calorie combustible gases for gas supply of users of small cities and populated areas.

6.8. In content of equipment of mixing installations should be switched on feed tanks, systems of regasification, mixing devices, instruments of control and control of process of mixing.

6.9. As mixing devices in function of which enters setting of proportions of mixed components and pressure increase of mixture,



should be applied ejector and other mixers, equipped by automatic batching devices.

6.10. Mixing of vapors of liquefied gases with air should be provided for in relationships/ratios, which ensure excess of upper limit of explosability of mixture not less than 2.5 times.

The mixing of gases can be accomplished/realized at low, average/mean and high pressures.

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6.11. To mixing installations of obtaining gas-air mixtures must be provided for automatic device for disconnection of installation in the case of approaching compositions of mixture to inflammability limits or in the case of sudden cessation of entrance of one of components.

6.12. Mixing installations it is allowed/assumed to place both in locations and on open pads, in accordance with requirements p. 2.59.

6.13. Buildings and locations for positioning/arranging evaporative and mixing installations, if they are located not in

building of filler department/separation of gas-distributing station, must correspond to demands pp of 2.19-2.22 present chapters.

7. Power supply, lightning protection and connection/communication.

7.1. Indications of present section apply to design of power supply, lightning protection and connection/communication of gas-distributing and auto-servicing stations, gas-filling points/items and intermediate storages of cylinders of liquefied gas, examined/considered in present chapter.

Power supply.

7.2. during design of power supply of buildings and constructions, enumerated in p. 7.1, should be been guided requirements of "rules of device of electrical devices" of state production committee on power engineering and electrification of USSR and by instructions of present chapter.

7.3. With gas supply only of residential consumers on reliability of power supply enumerated in p. 7.1 buildings and constructions should be carried to II category.

7.4. During arrangement of transformer substation in territory

of its gas-distributing or auto-servicing station one should provide for in separate building or block with building where are placed locations of repair shop, garage, by boiler room and other non-production locations.

On the gas-filling points/items and the intermediate storages of cylinders the power supply should be provided for from transformer substation, arranged/located out of their territory.

7.5. Packing of electric system of exterior lighting in territory of tank farm, drainage constructions and near production buildings (pump-and compressor, filler, regasification and mixing of gas with air) must be provided with electric cable or insulated wire.

7.6. Exterior lighting of territories of gas-distributing and auto-servicing stations, and also gas-filling points/items and intermediate storages of cylinders should be provided for by illuminating lamps into limits of dangerously explosive zone in execution V-2B, adjusted on incombustible supports.

On the perimeter of territory should be provided for guard illumination.

Control of the exterior lighting of territory must be

centralized and be accomplished/realized from the main switchboard.

7.7. packing of power lines above reservoirs and to territory of tank farm, and also location of electrical plants and power lines on reservoirs themselves is not allowed/assumed.

In the territory of the tank farm is allowed/assumed the arrangement/position of electric monitoring and measuring devices and automation, carried out in the explosion-proof performance.

7.8. Illuminating lamps of working illumination in locations of pump-and compressor, filler, regasification departments/separations and other dangerously explosive locations, which relate to class V-1a, must be provided for in execution not below V-2B.

Safety devices/fuses, and also switches of illuminating electric systems should be provided for dangerously explosive outdoors.

7.9. In locations of departments/separations of pump-and compressor, filling, drain and ore washer of cylinders, regasification and mixing of gas with air it is necessary to provide for additional emergency light, fed from line of force or by movable battery illuminating lamps in explosive-impenetrable performance.

7.10. In departments/separations pump-and compressor filler, regasification and other dangerously explosive locations is allowed/assumed packing of armored cables in channels with filling by sand.

The electric wiring in the steel tubes and the armored cables, provided for by packing on the walls of buildings, must be placed above the conduits/manifolds of liquefied gas.

7.11. Electric motors and starting/launching equipment for equipment, adjusted in locations, on explosive hazard relating to category V-1a, must be provided for in execution not lower than category V-2B.

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Lightning protection.

7.12. For production buildings, on explosiveness placed in category V-1a, should be provided for lightning protection of II category, switching on protection from direct impacts of lightning, electrostatic and electromagnetic induction, and also from skidding of high potentials through ground-based and underground metallic communications.

For the constructions, on the explosiveness placed in category V-1g, should be provided for lightning protection of the III category from the direct impacts of lightning and from the skidding of high potentials through ground-based metallic communications.

7.13. Construction/design of lightning conducting and grounding devices must satisfy the requirements of "rules of device of electrical devices" of state production committee on power engineering and electrification of USSR and "temporary/time indications in accordance with design and device of lightning protection of buildings and constructions" (SN 305-65).

Connection/communication.

7.14. For gas-distributing and auto-servicing stations, and also for gas-filling points/items and intermediate storages of cylinders should be provided for external and internal radio- or telephone communication between production locations and office.

7.15. In buildings on explosiveness placed in category V-1a, should be established telephone sets in explosion-proof or normal performance with arrangement/position of telephone sets dangerously

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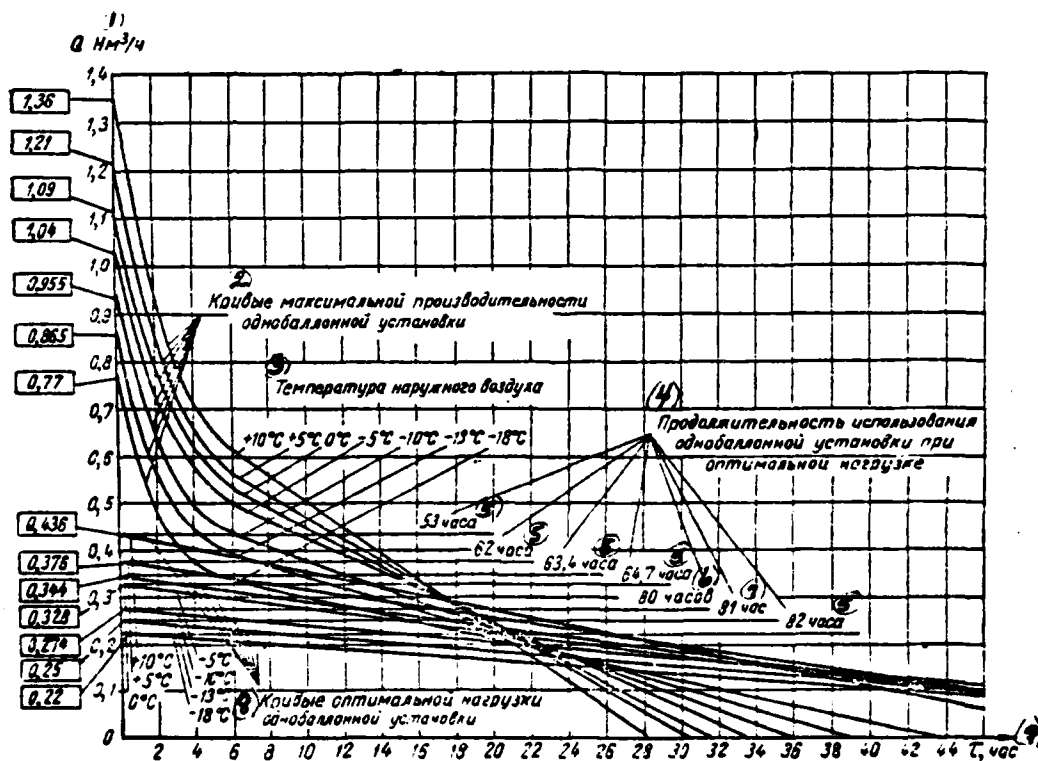
explosive outdoors with installation in special bays or boxes.

In the locations, on the explosiveness referred to category V-1g, it is allowed/assumed the installation of telephones to provide for in the normal performance.

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## Appendix 1.

Dependence of the productivity of single-tank installation on the time of evaporation (at different temperatures of surrounding air)



Key: (1). Nm<sup>3</sup>/h. (2). curves of peak output of single-tank setup. (3). Temperature of surrounding air. (4). Demand time of single-tank setup with optimum load. (5). hour. (6). hours. (7). hour. (8).



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Curves of optimum load of single-tank setup.

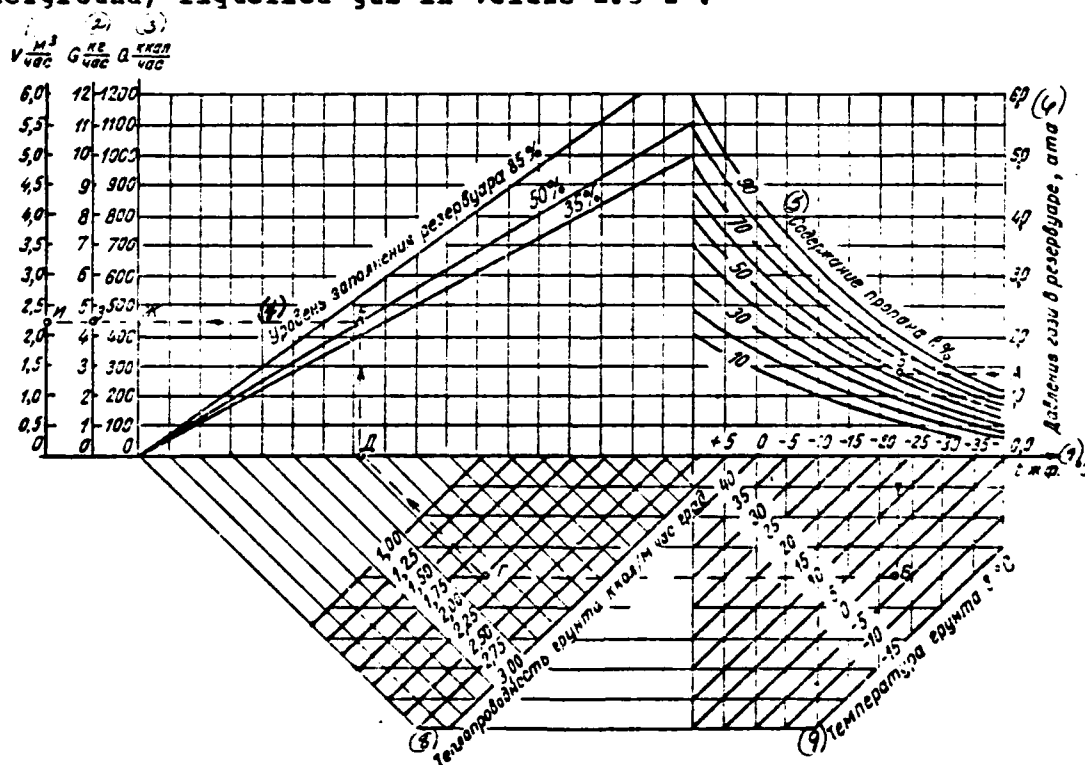
For the uniform work of stationary cylinder installation should be accepted the productivity of cylinder on the curves of optimum load.

During calculations one should take the average values of the volume of vapors of liquefied gases under the specific conditions.

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## Appendix 2.

Nomogram for determining the productivity of the reservoir (of underground) liquefied gas in volume 2.5 m<sup>3</sup>.



Key: (1). m<sup>3</sup>/h. (2). kg/h. (3). kcal/h. (4). level of filling of reservoir. (5). Content of propane into o/o. (6). Pressure of gas in reservoir, atm (abs.). (7). l.f. (8). thermal conductivity of soil kcal/m hour deg. (9). temperature of soil in °C.

The example: it is given:  $P=1.4$  atm(abs.);  $C_3H_8=600/o$ ;  $t_{gr}=3^{\circ}C$ ;  $\lambda_{gr}=2P$  kcal/m $\cdot$ h $\cdot$ deg, filling 500/o. We find:  $V=2.2$  m $^3$ /h;

A-B-V-G-D-Ye-Zh-Z-I

where  $V$  - productivity of reservoir in the m $^3$ /h;  $G$  - productivity of reservoir in the kg/h;  $Q$  - quantity of heat, conducted/supplied from the soil to the reservoir, in kcal/h.

Design load on the reservoir installation with the reservoirs by the volume of 2.5 and 4.4 m $^3$ , is determined from the formula:

$$q_p = \frac{n \cdot K_H \cdot q_{rod}}{Q_H^p \cdot 365 \cdot 24}$$

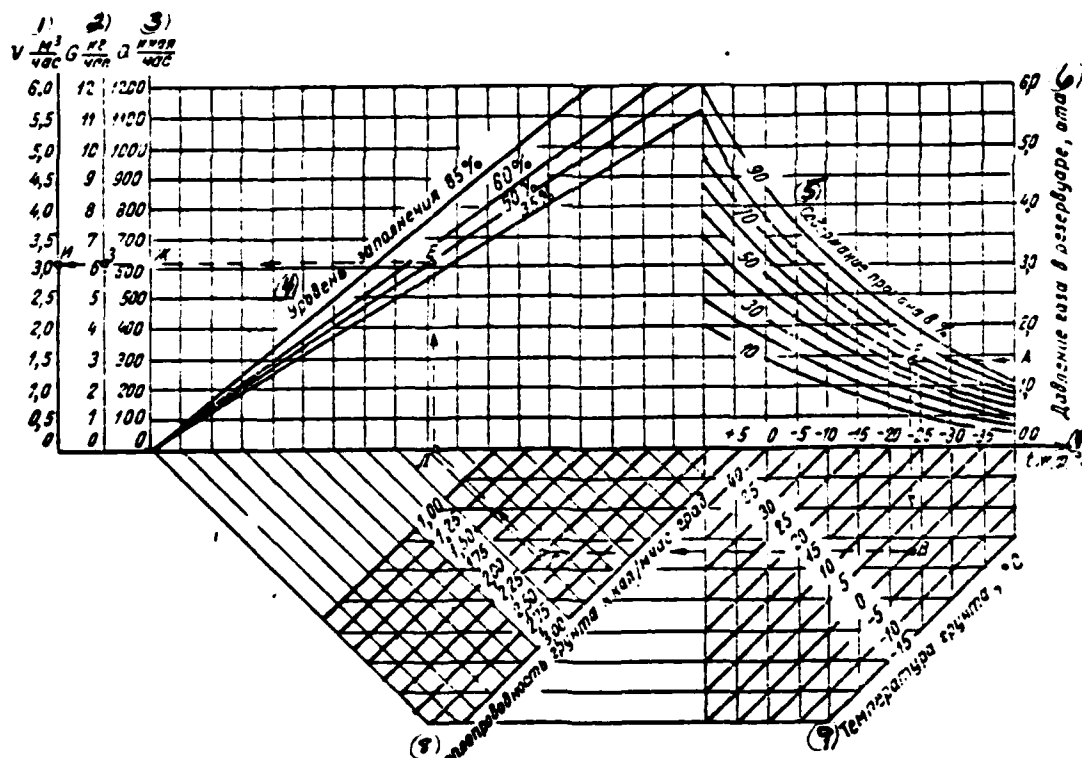
where  $q_p$  - design loads on the reservoir installation in the m $^3$ /h;  $n$  - number of inhabitants, who use gas, man/person;  $K_H$  - coefficient of diurnal nonuniformity in the year (in the presence of gas stoves -  $K_H = 1.4$ , in the presence of gas stoves and gas water heaters - 2.0);  $Q_H^p$  - heat of combustion of gas in the kcal/m $^3$ ;  $q_{rod}$  - expenditure of gas for 1 man/person in the year. in the kcal.

A quantity of reservoirs of reservoir installation is defined as quotient of the division  $\frac{q_p}{V}$ .

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## Appendix 3.

Nonogram for determining the productivity of the reservoir (of underground) liquefied gas in volume 4.4 m<sup>3</sup>.



Key: (1). m<sup>3</sup>/h. (2). kg/h. (3). kcal/h. (4). level of filling. (5). Content of propane in c/c. (6). Gas pressure in reservoir, atm(abs.). (7). l.f. (8). Thermal conductivity of soil kcal/m·h·deg. (9). temperature of soil.

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An example it is given to  $P=1.4$  atm(abs.);  $C_3H_8=60\%$  to  $gr=0^\circ C$ ;  
 $\lambda_{gr}=2.2$  kcal/m<sup>2</sup>h<sup>2</sup>deg; filling with 50% $^o$ . We find:  $V=3.1$  m<sup>3</sup>/h;  
A-B-V-G-D-Ye-Zh-Z-I

where  $V$  - output of reservoir in the m<sup>3</sup>/h;  $G$  - productivity of  
reservoir in the kg/h;  $Q$  - quantity of the heat, conducted/supplied  
from the soil to the reservoir, in kcal/h.

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The order of guarantee.

By an instructional-standard literature of construction, planning, scientific research organizations, ministries and departments.

Gosstroy of the USSR notifies, that all instructional-standard publications using the building and the building materials enter for sale only into the book magazines of the country.

Stroyizdat in V/O "Soyuzknaiga" produce the quarterly plans/layouts of the publication of an instructional-standard literature which in 45 days prior to the beginning of each quarter are sent into the book-trading network/grid, the ministries and the departments for the procedure of preliminary orders. These quarterly plans/layouts are published also in the "construction newspaper".

All interested organizations must in a timely manner (within 10 days after the publication of plan/layout in the "construction newspaper") direct claims to local Book Trade Administration or to corresponding book magazine.

The print runs of publications are established in accordance with the orders of local ones it is book-trading. In connection with this belated representation by the organizations of claims deprives Stroyizdat and V/O "Soyuzkniga" of the possibility to establish/install correct print runs and to ensure with the standard documents of all, for which they are necessary.

On the failures of local ones it is book-trading of the procedure of claims for the publications, declared in the quarterly plans/layouts, it is necessary to impart to division of the scientific-technical literature V/C "Soyuzkniga" (Moscow, Leninist prospectus, 15) and to Stroyizdat (Moscow, Tret'yakovskiy pryezd. d. 1).